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缺陷複合板輥軋加工變形機制之研究

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摘要

本文將以有限元素軟體DEFORM 來探討缺陷(內含空孔或介在物)複合板非對稱冷間壓著輥軋時，板材於輥隙內的塑性變形過程。探討在不同上輥輪輥徑、不同初始板厚比、不同上輥輪摩擦因子及不同空孔或介在物大小，在輥軋後缺陷板材之出口板厚比、曲率、輥軋負荷及不同空孔或介在物大小對各參數的影響，以及雙層複合板結合強度之大小。研究內容大致可分成三部分，一是探討缺陷複合板(內含空孔或介在物)對稱輥軋，兩種不同材質，且上下輥輪之輥徑、輥速皆一致之上下對稱輥軋。其次是探討缺陷複合板(內含空孔或介在物)之非對稱輥軋，但不限制上下輥輪之輥徑一致與上下板材板厚一致，著重於出口板厚比、輥軋荷重、出口曲率及空孔或介在物大小等。最後以實驗方法探討缺陷複合板(內含空孔或介在物)冷熱間輥軋，著重於結合強度之探討。研究分析結果可提供複合板輥軋加工時防止缺陷產生之參考。

關鍵字: 有限元素;缺陷複合板;輥軋;空孔;介在物

Study on Deformation Mechanism of Complex Rolling Processes with Defects Inside the Sheet

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Abstract

This study conducts a finite element analysis of the plastic deformation and bonding behavior of complex aluminum-copper sheets containing internal defective voids and inclusions in the asymmetrical cold rolling process. The influences of the roll diameter, the thickness ratio of the upper/lower sheet layers, friction factor, critical damage judgment value, total sheet thickness at the entrance to investigate the sheet thickness reduction ratio on the dimensions of the internal void at the exit, the void length at the front and rear of the inclusions and the effective stress/strain distributions in the complex sheet. Additionally, the evolution of closing of the correlation between the upper / lower voids under different rolling process parameters is explored. The present numerical results provide a valuable insight into the deformation mechanisms involved in the cold rolling of complex sheets with internal defects.

Key words: Finite element method;Voids;Inclusions;
Defective complex sheets